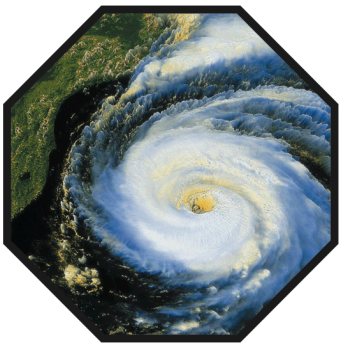
NASA SCIENCE MISSION DIRECTORATE

Earth-Sun System Applied Sciences Program
Disaster Management Program Element
FY2006-2010 Plan



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Expanding and accelerating the realization of economic and societal benefits from Earth-Sun System science, information, and technology

NASA Science Mission Directorate
Earth-Sun System Division
Applied Sciences Program

Applied Sciences for the Disaster Management Program Element:

This document contains the Disaster Management Program Element Plan for FY 2006-2010. This plan derives from direction established in the NASA Strategic Plan, Earth Science Enterprise and Space Science Enterprise Strategies, Earth Science Applications Plan, and OMB/OSTP guidance on research and development. The plan aligns with and serves the commitments established in the NASA Integrated Budget and Performance Document.

The Program Manager and the Applied Sciences Program Leadership have reviewed the plan and agree that the plan appropriately reflects the goals, objectives, and activities for the Program Element to serve the Applied Sciences Program, Earth-Sun System Division, NASA, the Administration, and Society.

(Signature on file) _____ _____
Stephen Ambrose Date
Program Manager, Disaster Management
Applied Sciences Program
NASA Earth-Sun System Division

(Signature on file) _____ _____
Lawrence Friedl Date
Lead, National Applications
Applied Sciences Program
NASA Earth-Sun System Division

(Signature on file) _____ _____
Ronald J. Birk Date
Director, Applied Sciences Program
NASA Earth-Sun System Division

NASA Earth-Sun System Division: Applied Sciences Program

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NASA Science Mission Directorate – Applied Sciences Program

Disaster Management Program Element Plan: FY 2006 - 2010

I. Purpose and Scope

This Applied Sciences National Applications Program Element Plan is applicable for Fiscal Years 2006 through 2010. The plan documents the purpose of the program and the implementation approach to meet the program objectives using the allocated resources. The plan describes the program element approach in extending NASA Earth-Sun system science research results to meet the decision support requirements of partner agencies and organizations. The Applied Sciences Program requires this plan to function as a program management tool, describing the program structure, functional mechanisms, performance measures, and general principles that will be followed in extending NASA research results for societal benefits.

Scope within NASA and Applied Sciences Program

Each National Applications Program Element is managed in accordance with, and is guided by, the NASA Strategic Plan and Earth Science Applications Plan. The program element benefits from NASA Earth-Sun system science research results and capabilities, including the fleet of NASA research satellites, the predictive capability of models in the Earth System Modeling Framework (ESMF), Project Columbia, the Joint Center for Satellite Data Assimilation (JCSDA), and the Earth-Sun System Gateway (ESG). The Applied Sciences Program seeks to develop with its partners scientifically credible integrated system solutions in which uncertainty characterization and risk mitigation has been performed using the capability of the national Earth-Sun laboratories and others in the community of practice.

The FY06 President's Budget for the NASA Applied Sciences Program specifies between $48 million and $55 million annually for FY06 – FY10. There are two elements to the Applied Sciences Program: National Applications and Crosscutting Solutions. Each National Applications Program Element benefits from the performance results of Crosscutting Solutions (see Crosscutting Solutions Program Element Plan). Each National Applications Program Element leverages and extends research results from the over $2 billion per year supporting Earth-Sun system science and development of innovative aerospace science and technology. Additional information about the NASA Applied Sciences Program can be found at http://science.hq.nasa.gov/earth-sun/applications.

The Disaster Management Program Element is one of twelve elements in the Science Mission Directorate's Applied Sciences Program. NASA and the Applied Sciences Program collaborate with partner organizations to enable and enhance the application of NASA's Earth-Sun system science results and exploration objectives to serve national priority policy and management decision-support tools. The desired outcome is for partner organizations to use project results, such as verification, validation, prototypes and benchmark reports, to enable expanded use of NASA science products and to enhance their decision-support tools, systems, and capabilities. The results of this work supports NASA's space exploration objectives to explore the Solar System and the Universe as well as NASA's research to operations transition objectives through the improvement in natural

hazard identification for preparedness, response, and mitigation.

The Disaster Management Program Element extends products derived from Earth-Sun system science results information, models, technology, and other capabilities into partners' decision support tools for disaster management issues. The Disaster Management Program Element addresses issues of concern and decision-making related to volcanoes, geology, subsidence, earthquakes, drought, wildfire, hurricanes, climate, wind, tornadoes, space weather, and flooding planning, prediction, and forecasting. The Disaster Management Program Element is designed to advance the use of products from NASA's cadre of 30 Earth-Sun observation spacecraft to improve our knowledge of Earth system processes and instrument capabilities and to extend these benefits to society. The Disaster Management Program Element focuses on decision support tools serving the following classes of issues related to the disaster cycle:

- Preparedness – Planning how to respond to a disaster
- Mitigation – Minimizing the effects of a disaster
- Response – Minimizing the hazards created by an emergency
- Recovery – Returning the community or environment to normal

NASA partners with Federal agencies and with regional-national organizations that have disaster management responsibilities and mandates to support disaster management managers. These include Local, State, Tribal and Industry partners. Partners include the U.S. Department of Homeland Security (DHS), the National Oceanic and Atmospheric Administration (NOAA), the Environmental Protection Agency (EPA), the Federal Aviation Administration (FAA), the U.S. Department of Agriculture (USDA), and the U.S. Geological Survey (USGS). The Disaster Management Program Element includes international organizations and activities provided to advance NASA national priority science to the international community. Disaster Management Program Element's activities benefit the Aviation, Homeland Security, Energy Management, Ecological Forecasting, Public Health, Air Quality, and Water Management Program Elements.

Through the Disaster Management Program, NASA provides results that support the White House Committee on Environment and Natural Resources (CENR)/Subcommittee on Disaster Reduction (SDR), Interagency Working Group on Earth Observations (IWGEO), World Summit on Sustainable Development (WSSD) and the interagency programs on Climate Change Science and Technology (CCSP, CCTP). This Program also works through such international agencies as the World Meteorological Organization/International Global Observing System (WMO/IGOS), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Committee on Earth Observation Satellites (CEOS), and other international countries and partners.
Priority NASA Science missions for the Disaster Management Program include Terra, Aqua, Aura, the Ice, Cloud, and land Elevation Satellite (ICESat), the Quick Scatterometer (QuikSCAT), CloudSAT, National Polar-orbiting Operational Environmental Satellite System (NPOESS), NPOESS Preparatory Project (NPP), Topography Experiment (TOPEX), Shuttle Radar Topography Mission (SRTM), Tropical Rainfall Measuring Mission (TRMM), Landsat, New Millennium EO-1, Jason, and Gravity Recovery and Climate Experiment (GRACE). Sensors include the Moderate Resolution Imaging Spectroradiometer (MODIS), Atmospheric Infrared Sounder (AIRS),Advanced Microwave Scanning Radiometer – E (AMSR-E), Lightning Imaging Sensor (LIS), SeaWinds, Enhanced Thematic Mapper (ETM), Ozone Monitoring Instrument (OMI) and other multispectral and visible sensor. Priority Science models include the Pennsylvania State University/National Center for Atmospheric Research Mesoscale Model (MM5), Global Climate Model (GCM), ETA, Weather Research Forecasting Model (WRF), WAVEWATCH III, and other NASA application models.

The project plans associated with the Disaster Management Program designate specific sensors and models and state specific partnership activities to extend NASA Science measurements, environmental data records, and geophysical parameters. This plan covers objectives, projects, and activities for FY05-09. In FY04 the Program's priority activities focused on extending the ability of the DHS/FEMA "Hazards U.S. Multi-Hazard" (HAZUS-MH) Decision Support System (DSS) and of wind modeling for coastal flood inundation information, as well as improved earthquake information from the Southern California Integrated Global Positioning System (GPS) Network (SCIGN).

In FY05, the Program's priorities focus on benchmarking the capability of HAZUS-MH using the WaveWatch III model and NASA data and evaluating the results from the 3-year SENH NRA projects funded in FY03. In FY06 the focus will be on the Advanced Weather Interactive Processing System (AWIPS). These areas are for supporting the advancement and new generation of the NOAA NWS AWIPS, continuing the advancement of spacecraft observations and products into the current AWIPS system. There are a number of international initiatives related to sustainable development (WSSD), geoscience, tsunami/ocean monitoring, hurricane applications research, IWGEO, and GEOSS.

II. Goals and Objectives

Goals

Enable partners' beneficial use of NASA Science research results, observations, models, and technologies to enhance decision support capabilities serving their disaster management, disaster warning, risk reduction, and policy responsibilities. Major tenets of the Disaster Management Program's goals include the following:

- Develop and nurture partnerships and networks with appropriate disaster management organizations
- Identify and assess partners' disaster management responsibilities, plans, and decision support tools, and evaluate the capacity of NASA science results to support these partners
- Validate and verify application of science results with partners, including development of products and prototypes to meet partners' requirements
- With partners, document, verify, and validate the value of Science results in decision support tools and support the tools' adoption into operational use
- Communicate results and partners' achievements to appropriate disaster management communities and s stakeholders
- Advance NASA exploration objectives in the Science Mission Directorate where opportunities and Earth-Sun system science and applications enable the success of planetary and space exploration.

Objectives

All National Applications Program Elements are aligned to the NASA Strategic Plan and the agency's objectives as expressed in the NASA Integrated Budget and Performance Document (IBPD) and the Performance Assessment Rating Tool (PART).

Short-term Objectives (major milestones) (FY05-Early FY06 -- dates below in Calendar Year)

March 2005
• Work with research community to develop tsunami risk map and corresponding flood inundation, incorporate global socio-economic information from CEISIN.
• March 2005 Complete SDR Grand Challenges Report under the auspices of the OSTP/SDR.

August 2005
• Schedule a results conference/workshop (May 2005) on satellite product benefits to the Disaster Management Program (SENH workshop).
• Complete SENH NRA closeout report (August 2005).

October 2005
• Validate science inputs from at least one sensor and one model into at least two separate disaster management decision tools and policy/management activities – results from the MSFC LATEST Project.
• Terra, Aqua, QuikSCAT, TRMM, ASTER, LandSAT, or EO-1

October 2005
• Establish agreements with at least two federal partners and at least one non-federal partner in disaster management (IMAAC MOU)
• Establish final report summary on nine projects funded through a Solid Earth and Natural Hazards (SENH) NASA Research Announcement (NRA) showing how projects met the integrated systems solutions diagrams and develop report from the SENH Workshop.

October 2005
• Complete benchmark reports and conduct a results conference on science support to at least one disaster management decision support tool (HAZUS).

October 2005
• By October 2005 publish at least three articles on disaster management applications of science, including at least one in a peer-reviewed journal (final deadline for 3 conferences/journals in planned in FY05) (Know Risk Book, 1st Conference on Geo-Information for Disaster Management, IGARRS or AGU, other journals)

<u>Long-term Objectives (FY06-09)</u>

January 2006
• Develop strategy for InSAR mission use towards applications for landslide, earthquake, ocean, and other hazards.
• Work with NOAA and USGS, and OSTP on decision support priorities.
• Incorporate space weather into disaster management priorities related to earthquake prediction and monitoring.
• Begin AWIPS DSS evaluation and enhancement of the AWIPS DSS.

April/May 2006
• Work with federal partners on utility of NPP products relevant to NASA risk reduction (MODIS to VIIRS for example).
• Establish MOU with USGS and NOAA on InSAR applications research.

June 2007
• Establish TRMM to GPM applications transition/risk reduction development to support AWIPS decision support system.

January 2008
• Prepare for NPP to NPOESS transition and capabilities to support AWIPS and HAZUS decision support systems.
• Work with USDA Forest Service on wildfire monitoring and risk reduction going from NPP to NPOESS.

June 2008
• Prepare OSSE's for Aquarius products to enhance weather, climate and ocean applications and modeling through improved salinity observations for sea level monitoring.

January 2009
• Complete transition of NPP to NPOESS products and prepare for next generation of earth observation satellites for the next decade.

III. Program Management and Partners

A. Program Management

Disaster Management Program Manager:
Stephen Ambrose,
NASA-Headquarters

Responsibilities:

- Program development, strategy, plans, and budgets
- Program representation, advocacy, and issues to Applied Sciences Program management and beyond
- Communication of Applied Sciences Program priorities and directives to Disaster Management Program team/network
- Implementation of interagency agreements and partnerships
- Monitoring of Disaster Management Program metrics and performance evaluation
- Co-Chair of CENR/SDR/Earth Observations Working Group guides Presidential policy on disaster management through this Office of Science and Technology Policy (OSTP) group of agencies
- Represent NASA on the National Academies Disasters Roundtable - an interagency, university, and corporation group
- Represent NASA on the Natural Hazards Center Steering Committee - A social science and disaster management steering committee

Disaster Management Co-Deputy Program Manager:
Dr.. Rodney McKellip (acting),
NASA-Stennis Space Center (SSC)

Responsibilities:

- Leadership on project plans, development, performance, and partnership relationships
- Communication of project metrics, performance, status, and issues to Program Manager
- Leadership and communication to Disaster Management Program team and network
- Coordination between NASA Centers on Disaster Management Program activities

Dr. Shahid Habib,
NASA-Goddard Space Flight Center (GSFC)

Responsibilities:
- Leadership on project plans, development, performance, and partnership relationships
- Communication of project metrics, performance, status, and issues to Program Manager
- Leadership and communication to Disaster Management Program team and network
- Coordination between NASA Centers on Disaster Management Program activities
- Management of grants and cooperative agreements funded through Stennis Space Center (SSC) and cooperative agreements
- Management of Disaster Management Program tasks at SSC
- Management for grants funded through GSFC and cooperative agreements
- Management of Disaster Management Program tasks at GSFC

B. Disaster Management Network & Partners

NASA Center and HQ Contacts:

Mr. Ron Blom (Geology) - Jet Propulsion Laboratory (JPL)
Dr. James Brass/Vince Ambrosia (Wildfire) - Ames Research Center (ARC)
Dr. Steve Goodman (Weather, Severe Storms, AWIPS) – Marshall Space Flight Center (MSFC)
Dr. Shahid Habib (Hurricane, AWIPS, Landslide, Precipitation, Fire) – Goddard Space Flight Center (GSFC)
Dr. John Murray (Weather, U.S. Weather Research Program (USWRP) – Langley Research Center (LaRC)
Dr. Andy Negri/Dr. Bob Adler – Hurricane, Flood, Landslide Continuum
Dr. John LaBrecque – Geodetic Imaging, Hazard Research
Ms. Myra Bambacus – Geospatial Interoperability Office (GIO), GSFC
Dr. Gran Paules – Technology Division
Ms. Kitty Kavens – International and Interagency Activities
Ms. Elizabeth Williams – International Affairs
Dr. Nevin Bryant – JPL
Dr. Herb Frey – GSFC
Dr. Eric Lindstrum – NASA HQ; NASA POC for CEOS/UNESCO IOC
Dr. Roger Flaherty – GSFC/TDRSS Communications
Dr. Fran Stetina – GSFC – Cellular Phone technologies
Mr. Michael Pascioto – Technology Development Manager
Dr. Donald Deering – NEESPI – GSFC
Mr. Randal Albertson – DFRC
Dr. Ranty Liang – JPL
Dr. David Tralli – JPL, ISRSE
Ms. Elizabeth Plentovich – LaRC

NASA DAAC's, SEDAC Dr. Bob Chen
NASA Laboratories

Federal Partners:

Department of Homeland Security (DHS)
Ed Laatche – FEMA, Program Policy and Assessment Branch
Chris Doyle – Science and Technology (S&T)
Nancy L. Suski – DHS, Emergency Preparedness and Response (EP&R Portfolio)
Dr. Bruce Davis – DHS, Emergency Preparedness and Response (S&T, EP&R Portfolio)
Mr. John J. Perry – FEMA, EP&R Remote Sensing Program
Mr. Cliff Oliver – FEMA HAZUS-MH Program Development

National Oceanic Atmospheric Administration (NOAA)
Ms. Helen Wood – NOAA National Environmental Satellite, Data and Information Service (NESDIS) (SDR Chair/IWGEO/GEOSS)
Ms. Donna McNamara – NOAA/NESDIS
Dr. David S. Green – NWS/AWIPS, Program Plans and Integration
Dr. Dan Tarpley – NESDIS/ORA
Mr. Gregory Withee – NESDIS/IWGEO/GEOSS
Mr. Gerry Dittberner – NESDIS/R2O
Mr. Dave Helms – NWS HQ/AWIPS
Mr. Frederick Branski – NWS/OFCM/ICMSSR
Dr. Frank Marks – Hurricane Research Division
Leroy Spayd – NWS HQ MSD

State Department
Mr. Alan L. Davis – Humanitarian Information Unit (HIU)
Mr. Larry Roeder – State Department (WCDR)/GDIN
Ms. Tiffany Hill – GIS Intelligence Consultant/HIU
Dr. Fernando R. Echavarria – Space and Advanced Technology Staff

United States Geological Survey (USGS)
Ms. Roz Helz – USGS, Earthquakes and Volcanoes (SDR/RSAWG)
Mr. Tim Cohn – USGS (SDR Representative, Grand Challenges Representative)
Dr. Wayne Thatcher – USGS, Menlo Park, GPS Networks
Dr. Nina Burkardt – Fort Collins Science Center
Ms. Jean Weaver – Coordinator for Central America, S. America, Caribbean
Dr. Randy Updike – USGS
Dr. David Applegate - USGS

United States Department of Agriculture (USDA)
Mr. Tom Bobbe – Forest Service, Remote Sensing Applications Center
Mr. Paul Greenfield – Forest Service Headquarters/USDA MOU
Dr. Susan Conard – U. S. Forest Service

Dr. Diane Petrino – USDA Food Security
Dr. Wei Min Hao, Fire Chemistry Project
Mr. Douglass Shinn – Forest Service, Fire and Aviation Management
Ms. Alice Forbes – NIFC, Director Operations

University:

Dr. Douglas Stow – Sand Diego State University/REASoN
Dr. John Jensen – U of S. Carolina/REASoN
Dr. Ray Williamson – George Washington University/Space Policy Institute
Dr. David W. S. Wong – George Mason University
Dr. Richard Gomez – George Mason University
Dr. Linda Musial – Charles County Public Schools/Outreach/Education
Dr. William Craig – U. of Minnesota
Dr. Michael A. Rosenblum – MIT
Dr. Arlin Kruger – U MD
Dr. Michael Hodgson – U. S. Carolina
Dr. Menas Kafatos – George Mason U.

State, Local, Tribal:

Mr. John H. Talley – Delaware State Geologist
Maurice A. Tatlow – Arizona Hydrologist
Tim Haithcoat—University of Missouri, Columbia

American Red Cross
Dr. Rocky Lopes – Disaster Services

Corps of Engineers (COE)
Mr. Andrew Bruzewicz – Office of Homeland Security Industry
Dr. Robert Ryan – Lockheed Martin/SSC
Dr. Lisa Warneke – Consultant/IAGT
Dr. Timothy Gubbels – SAIC
Dr. Tim Foresman – ICRSE
Ms. Mary Ellen Brown – GeoData Systems
Mr. Ronnie Yaron – Skyline Software
Ms. Sue Gray – Sky Research, Inc
Mr. Tom Strange – General Dynamics, SSC
Mr. Brian Tucker – Geohazards International

International, National, and Regional Organizations

Mr. Michael Hales – NOAA/NESDIS International Affairs -
CEOS – World Summit on Sustainable Development (WSSD)
Dr. Pricilla Nelson, Dr. Dennis Weneger – NSF
State Department, Humanitarian Information Unit (HIU)
Mr. James Weber – International Symposium on Remote Sensing of the Environment (ISRSE) Organization
Dr. Charles Hutchison – University of Arizona
Dr. Thomas Schaff/Dr. Mario Hernandez – UNESCO
Dr. Lisa Vandemark – NRC
Mr. Jim McNitt – OFCM
Dr. Dusan Sakulski – United Nations University
Dr. Louis Buys – Dept. of Provincial and Local Governments, S. Africa
Dr. Alain Retiere – United Nations Institute for Training and Research
Dr. Sergey Pulinets – Instituto de Geofisica – Mexico
Dr. Leonid Bobylev – NIERSC
Jean-Paul Malingreau – European Comisión
Robert Missotten – UNESCO MOU
Dr. Walter Erdelen – UNESCO
Dr. Josef Aschbacher – ESA/TIGER
Dr. Nina Novikova – Russian Aviation and Space Agency
Dilip Kumar Ratha – World Bank, Senior Economist
Lasse Pettersson – NIERSC
Dr. Marcio Babosa – UNESCO Deputy Director General

Domestic

Climate Change Technology Program (CCTP):
- The Office of Science leads a CCTP task group on measurements and monitoring supported by the Disaster

Management Program.

- The Climate Change Science Program (CCSP)– A joint federal program of the President's Committee on Climate Change Science and Technology Integration has issued its strategic plan to address some of the most complex questions and problems dealing with long-term global climate variability and change.
- U.S. Weather Research Program – Weather research initiative to improve weather modeling through intensive field campaigns.
- Solid Science Working Group (SESWG) – Blue-Ribbon panel produced document on solid Science and research.
- CENR Subcommittee on Disaster Reduction (and associated Working Groups) – Office of Science and Technology Policy (OSTP) subcommittee and joint effort from all Federal agencies; NASA is co-chair of the Remote Sensing Applications Working Group (RSAWG)
- Geospatial One Stop (GOS) – GIO collaboration to bring interoperability to the federal community.
- Federal Geographic Data Committee (FGDC) – NASA participates in the standards committee for Homeland Security and Geographic Information.
- Global Learning and Observations to Benefit the Environment (GLOBE) - Disaster Management played a role in the selection of the current contractor, University Corporation for Atmospheric Research (UCAR), and continues to participate in GLOBE-sponsored events and school visitations.
- Interagency Program Office (IPO) for NPOESS – This interagency office that has NASA representation is participating in assessing and validating future NPOESS instruments and science.
- Interagency Working Group on Earth Observations (IWEGO)

<u>International</u>

- International Global Observing System – Through the Earth Observation Summit and the World Meteorological Organization, NASA SMD contributes by providing NASA capabilities for research.
- Global Climate Observing Strategy (GCOS) – NASA participates in international meetings related to GCOS and related data management issues.
- World Summit for Sustainable Development (and 4 Working Groups) – the Disaster Management Program leads Module 3 – Disaster Management and Conflict of the type-2 partnerships under the WSSD and partners with other space agencies involved in WSSD.
- International Symposium on Remote Sensing of the Environment (ISRSE) NASA plays a lead role in the bi-annual conference.

Ad Hoc Group on Earth Observations (GEO)

IV. Decision Support Tools and Management Issues

Priority Decision Support Tools

HAZUS-MH

The HAZUS-MH Loss Estimation Tool is a Geographic Information System (GIS) based DSS tool developed by the U.S. Federal Government for estimation of loss caused by natural hazards and other disasters. FEMA oversees HAZUS-MH activities at large, whereas the National Institute for Building Sciences (NIBS) manages this tool's development and implementation for use by the Federal, State, and municipal emergency management communities. FEMA initially released HAZUS in 1999 as HAZUS-99 SR2, primarily as a tool for earthquake disaster risk assessment. HAZUS was expanded in the past year to include hurricanes (wind) and flood assessments (coastal included). Each HAZUS-MH module (earthquake, wind, flood) allows the user to map, assess, and display geospatial data pertaining to a specific natural hazard to assess and mitigate hazard risk. HAZUS-MH also enables estimation of physical damage to buildings, critical facilities, and other infrastructure. In addition, each hazard-specific module gives estimates of economic loss (e.g., lost jobs, business interruption, repair costs, construction costs) and social impacts (e.g., identifying requirements for shelters and medical aid) from a variety of census tract information. NASA's role in HAZUS-MH is to benefit the HAZUS-MH application through the infusion of NASA Science research results. For example, during FY04 NASA funded an activity to enhance HAZUS-MH in its ability to determine wind and wave assessments using the WaveWatch III model (a NASA derived model modified by NOAA). NASA observation technologies and modeling expertise in wind and digital elevation modeling, through QuikSCAT and ASTER sensors, respectively, can improve the HAZUS-MH DSS through broader observations and improvements to HAZUS-MH models. Surface roughness characteristics were also studied under this contract and in collaboration with Stennis Space Center. This project is in its second year and V&V and benchmark results will be delivered in FY06.

Advanced Weather Interactive Processing System (AWIPS)

A high-speed, technologically advanced weather processing, display, and telecommunication decision support system called the Advanced Weather Interactive Processing System (AWIPS) is the centerpiece of National Weather Service operations. AWIPS is an interactive computer system that integrates all meteorological, hydrological, satellite, and radar data into one computer workstation that forecasters use to create their daily products at some 150 Weather Forecast Offices (WFO) and River Forecast Centers (RFC). AWIPS allows forecasters the interactive capability to view, analyze, combine, and manipulate large amounts of graphical and alphanumeric weather data, such as weather, flood, air quality, and marine weather forecasts. NOAAPORT, the NOAA portal to data and information served to AWIPS and other users of meteorological, hydrological, and oceanographic data and is the communications arm to the weather community. AWIPS utilizes a number of spacecraft products and applications that can be enhanced by NASA research and applications. When partnered with NOAA, NASA products can improve the information provided to NWS field offices. This partnership will advance data processing, archive, transmission, and display of spacecraft information for the weather forecaster. The Disaster Management Program works with NOAA to improve AWIPS' ability to incorporate more of NASA's assets into the meteorologists' decision-making processes. For example, TRMM satellite observations of lightning can improve NWS forecasts of severe weather. The NASA Short-term Prediction Research and Transition (SPoRT) Center is improving lightning detection methods and is working with the NWS Southern Regional Headquarters to put this information into the hands of forecasters. The SPoRT facility is a central NASA center for incorporating NASA research results to the AWIPS user community. In addition to providing NASA remote sensing and modeling capabilities, NASA has a wealth of data management, data communications, high performance computing, and complex modeling experience that may provide significant improvement to AWIPS as AWIPS develops the next generation decision support system. By providing the NOAA with NASA satellite expertise and data communications experience, NOAA can enhance the AWIPS to provide more satellite data and model outputs to the NWS field offices and users of NOAAPORT. Increases in satellite utilization with future NPOESS and NPP data, along with improved communications and data processing capabilities essential to maximizing AWIPS' usefulness will be the goal in FY05 as AWIPS continues to operate and the next generation of AWIPS gets underway. FY06 will be a year of evaluation of AWIPS as well as development of current projects focused on the NWS Southern Region, both in its current operation as well as for development of its next generation system. This program will work closely with the crosscutting applications that deal with high performance computing, systems integration, and systems communications to better enhance AWIPS as the system is re-developed for NWS operations.

Remote Sensing Applications Center (RSAC)

In response to demand from agency managers, who are increasingly challenged by complex problems during the fire and fuels planning and post fire restoration processes, fire research and development (R&D) has expanded programs on management of fire and fuels, predicting effects of fire, and social and community processes, while continuing to develop improved products to support fire suppression for applications. Examples of recent tools and products in response to these challenges include1: 1) A fire growth simulator for assessing wildfire growth potential and fuels treatment priorities (FARSITE); 2) A modeling framework to predict cumulative smoke impacts from forest, rangeland, and agricultural fires (Blue Sky/RAINS); 3) A multi-agency, inter-disciplinary product designed to produce geospatial data of vegetation conditions, fire fuels, risks, and ecosystem status at the national, regional, and local scales (LANDFIRE). The Disaster Management Program works with the USDA Forest Service and related agencies to enhance their decision support system for wildfire management. For example, the RSAC of the U. S. Forest Service utilizes NASA satellite observations for wildfire monitoring, mitigation, and response. Information from the RSAC is fed across the U. S. Forest Service to a number of response teams. This information is also delivered to the National Interagency Fire Center, a decision support center for national fire coordination. The decision support system used by the NIFC is FIREWISE. The FIREWISE system is a homeowner, firefighter, and education system to help prepare, mitigate, and improve a residence, business, and community against wildfires. Forest Service has developed an architecture towards applications. This illustrates this complex cycle of research, development, and application they have developed.

Potential Disaster Management Management Issues: FY06-FY10

The Disaster Management Program Element authorizes studies, working group participation, program reviews, and other endeavors to ensure the Program's overall success.

Activity: CENR Subcommittee on Disaster Reduction and related Remote Sensing and Applications Workgroup
Purpose: Guide Presidential policy on disaster management through this OSTP group of agencies
Manager: Stephen Ambrose,
NASA HQ Goals: The SDR coordinates and creates policy documents that are reviewed by agencies and signed by the OSTP CENR. For example, the first document completed this year was "Reducing Disaster Vulnerability through Science and Technology." This collaborative document identified current disaster risks and agency activities. In FY04, SDR activities are structured to work closely with the Earth Observation Summit activities and implementation plans, both nationally and internationally, as well as to improve interagency coordination of challenges facing the hazards community.

Activity: U.S. Weather Research Program (USWRP)
Purpose: NASA participates in USWRP activities, such as THORPEX. The SPoRT Center at MSFC participates in severe weather research to benefit model inputs to USWRP research activities.
Managers: John Murray (LaRC), Steve Goodman (MSFC)
Goals: Ensure NASA assets are included in program experiments under the USWRP.

Activity: Consortium for International Science Information Network (CEISIN)
Purpose: Socioeconomic DAAC and Socioeconomic Data and Applications Center (SEDAC)
Managers: Steve Ambrose
Goals: Integrate applications with socioeconomic data; Establish partnerships with humanitarian and sustainable development organizations to establish joint projects. Work with earthquake community to establish risk assessments linked to population data. Bob Chen is the CEISIN DAAC manager.

Activity: State Department Partnership, Humanitarian Information Unit
Purpose: Work with the State Department in implementing DSS for the HIU. Coordinate geospatial data inputs with the GIO.
Managers: Steve Ambrose, Rodney McKellip (SSC), Myra Bambacus (GIO)
Goals: Demonstrate NASA capabilities to improve interoperability and humanitarian support. Work with State Department, HIU, CENR, GEOSS to establish coordination for a global tsunami warning system.

Activity: Committee on Environmental Information Systems and Communications (CEISC)
Purpose: Coordinates under the OFCM policy and requirements in support of earth observations and systems, a subcommittee of the ICMSSR. Mr. Fred Branski and Michael Howland co-chairs.
Manager: Steve Ambrose
Goal: Interagency coordination of observing system requirements, new technologies, frequency management, and other issues.

Activity: Natural Hazards Research and Applications Center
Purpose: To include societal impacts of disaster management in the program element; This center is supported by NASA to advance the understanding of hazards' impacts on society. The Disaster Management program manager

is on the advisory committee of this non-profit center.
Manager: Kathleen Tierney (University of Colorado)
Goal: To influence the disaster management community to utilize social science as a requirements input for disaster management research and applications development.

Activity: Program Planning and Disasters RoundTable
Purpose: Support interagency coordination and activities related to disaster management. Funds to support studies, reports, and other activities sponsored through the RoundTable and other organizations, especially activities related to use of Science results.
Manager: Steve Ambrose
Goal: To influence the disaster management community to utilize social science as a requirements input for disaster management research and applications development.

Activity: Wildfire Management (NV, CA) - DEVELOP activity
Purpose: This 3-D visualization uses Science information to map and monitor invasive and noxious plant species encroaching in the northern Nevada territory and considered wildfire fuel on Native American Lands.
Proposed NASA source data: SRTM, ICESat, Aqua
Manager: DEVELOP/Crosscutting Solutions Program Element
Goals: To incorporate NASA satellite data into wildfire management; to demonstrate this capability to the wildfire management community

Activity: Disaster Management - DEVELOP activity
Purpose: To deliver NASA Earth-Sun system science to local communities
Manager: DEVELOP/Crosscutting Solutions Program Element
Goals: To incorporate NASA satellite data into homeland security air plume transport and dispersion modeling to demonstrate this capability to the state homeland security management community.

Activity: Education Fellowships
Purpose: The Education Program funds a number of student fellowships. The projects related to disaster management are monitored and mentored.
Goals: To ensure the results of this Science research are carried forward into the user community.

Cross-Application Activities

The program consists of functional elements that contribute to all of the National Applications activities. The intention is to have the performance of these functions leverage accomplishments, and therefore the apparent resource investment, to the greatest extent possible into the National Applications partnerships. These functions are: Geoscience Standards and Interoperability, Human Capital Development, Integrated Benchmark Systems, and Solutions Networks. Examples of leveraged activities are:

- The Earth-Sun System Gateway is a "portal of portals" providing an access point through an Internet interface to all web-enabled NASA research results.
- A Solutions Networks capability to discover candidate configurations of NASA research results with the potential to improve partner’s decision support systems.
- A Rapid Prototyping Capability to support NASA and partners in reducing uncertainty and testing the

validity of NASA research results in decision support tools.

- Systems integration capability, knowledge tools and skilled human capital to help conduct studies on the systematic transitioning of the results of research to operational uses and the capability of operational systems to support scientific research.
- A student-based, human capital development program for building capability in entry level participants in the community of practice while developing solutions for state and local applications.

V. Application Activities

A. Projects

All National Applications Program Elements authorize peer-reviewed projects to support each element's goal and objectives. To secure funding and authorization to undertake activities supporting NASA and the Applied Sciences Program, project teams are responsible for developing project plans and managing the activities. The project plans specify the Earth-Sun observations, models, and other research results to extend to decision support tools as well as the activities to produce appropriate deliverables. The plans integrate contributions from appropriate the partners, NASA Centers and other contributors from the community of practice. Projects are expected to extend the benefits of NASA research results to the maximum extent possible, including the use observations from sensors on: Aura, Terra, Aqua, TRMM, NPP, NPOESS, Hydros, Topex, Jason, OCO and Aquarius.

B. Solicitations

The Applied Sciences Program utilizes full and open competitions to fund proposals from the community to contribute the Agency's objectives. This implementation strategy will continue to be critical part of extending the benefits of NASA Earth-Sun system research results and contributing to the improvement of future operational systems. The Program has participated in providing opportunities to the community in recent solicitations, including REASoN, Decisions 2004, and Decisions under ROSES. The proposals related to this National Applications Program Element that have been funded under these solicitations are described in Section V.D. Program Element Projects.

C. Congressionally Directed Activities

As of the publication of this document, an assignment of FY06 congressionally mandated activities was not completed by the Agency.

The procurement rules and management practices of the Agency require that congressionally mandated activities follow the same principles of planning and accountability as all other funded projects. Only activities that are aligned with NASA's mission, are technically credible, and are appropriately budgeted will be approved to receive funding from the Program. The project teams of congressionally mandated activities are responsible for developing project plans and managing the activities.

D. Program Element Projects

Included below are the brief descriptions of the funded projects managed under this National Applications Program Element. Complete and detailed descriptions are documented in the Project Plans for each activity.

Project: Solid Earth Natural Hazards Projects (SENH)

In 2001 10 projects were funded for applications under the old program. These projects are coming to completion. One project was completed two years ago and will not be included in the benchmarks due this year. 1. Development of a Real-Time GPS/Seismic Displacement Meter: Applications to Civilian Infrastructure in Southern California 2. Use of NASA Land Data Assimilated (LDAS) Products to Improve Flood and Drought Risk Analysis and Forecasting for Water Resources Management in the Columbia River Basin 3.Monitoring of Extreme Flood Events in Romania and Hungary Using EO Data; 4. Monitoring Subsidence at the Lost Hills Diatomite Oil Field, California, with SAR Interferometry and Other Remote Sensing Technologies 5. Assessing the Effects of Sea Level Rise on the Patterns of Coastal Flooding and the Distribution and Extent of Wetlands in the Chesapeake Bay Using Landsat and Satellite Radar Imagery

Budget ($K)	
Procurement	
FY06	
FY07	0
FY08	0
FY09	0
FY10	

Project Manager	*Centers*	*Timeframe*	*Partners*
Stephen Ambrose		FY200 - FY200	USGS, NOAA, Various Universities

Earth Science Products	*Other Apps.*

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report		
Design & Implement		
Verification and Validation Report		
Benchmark Report	12/1/2006	9 Projects

Notes: Description cont'd: 6. Apps of Remote Sensing Data and a Regional Forecast System for Improving Flash Flood and Fire-Weather Forecasts in So. Calif. 7. Remotely Monitoring Plant and Soil Fuel Moisture for Wildfire Danger Assessment Using Satellite RADAR Data 8. Rapid Response with the USDA FS: Use of NASA EOS Data to Improve Federal Response to Wildfire 9. Documenting Natural Hazards in Steep, Densely Forested Regions with Airborne Laser Swath Mapping.

Project: MRC-IDQ - Integrating Climatic and Fuels Information into National Fire Risk DST				Congressionally Mandated	
Mississippi Research Consortium project.				*Budget ($K)* *Procurement*	
				FY06	
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	
Robert Venezia	SSC	FY06 - FY07	MSU	FY08	
				FY09	
				FY10	
Earth Science Products				*Other Apps.*	
Deliverables	*Description*	*End Date*	*IBPD Metric #*		
	Evaluation Report				
	Design & Implement				
	Verification and Validation Report				
	Benchmark Report				
Notes:					

Project: Hurricane, Flood, Landslide Continuum - Deformation, Landslides, Mudslides				Directed Project	
Purpose: To insert NASA's remote sensing technologies from remote sensing measurements and models into AWIPS DSS and other decision tools for earthquakes, deformation, and landslides. Goals: To transfer NASA's Science results to decision support systems for landslide information, primarily focused on the Caribbean region then to National Priorities. To improve forecasting capabilities for landslides induced by earthquakes and rainfall.				*Budget ($K)* *Procurement*	
				FY06	250
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	300
Shahid Habib	GSFC	FY05 - FY09	DHS, FEMA, USGS, NOAA,	FY08	200
				FY09	200
				FY10	0
Earth Science Products	SRTM, InSAR, Terra, Aqua, Aura, TRMM			*Other Apps.*	
Deliverables	*Description*	*End Date*	*IBPD Metric #*	Aviation, Water Management	
	Evaluation Report				
	Design and Implement				
	Verification and Validation Report				
	Benchmark Report				
	Project Plan	1/31/2006			
Notes:					

Project: WSSD Sustainable Development for Africa - Directed Project

Purpose: Working with the International Community, partner with projects relevant to NASA Applied Sciences Program for the advancement of NASA science for decision support. NASA has Module 3 leadership under the CEOS WSSD Type-2 partnerships, leverage NASA grants to be applied to WSSD partnerships in Africa. A component of this work will be to work with the SENH community towards advancement of their research results to international applications. FY06 will include an inventory of NASA funded projects contributing to WSSD. A webpage will be developed to allow investigators to update their project details and activities.

Budget ($K)

Procurement

FY06	150
FY07	300
FY08	100
FY09	100
FY10	0

Project Manager	*Centers*	*Timeframe*	*Partners*
Rodney McKellip	SSC (lead), GSFC	FY05 - FY09	Congressionally Mandated programs,

Earth Science Products: SRTM, ASTER, ALI, Landsat, Terra, Aqua, QuikSCAT

Other Apps.: Aviation, Public Health, Agriculture, Water Management

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report		
Design and Implement		
Verification and Validation Report		
Benchmark Report		
Project Plan	10/1/2005	
Report-WSSD related DSTs	4/1/2006	
Results conference	6/11/2006	

Notes:

Project: Wind, Surface Roughness, WaveWatch for HAZUS-MH — Directed Project

Purpose: To insert NASA's Science results into HAZUS-MH capabilities with remote sensing and model development for wind and wave assessments. Goals: Provide improved remote sensing data sources for HAZUS-MH hurricane, wind, and surge models to include NASA remote sensing technologies, such as TRMM, QuikSCAT, and MODIS. Validate surface roughness parameters (sensitivity analysis) for this application as well as satellite input improvements. Project was funded in FY04 for completion in FY05.

Budget ($K)

Procurement

FY06	0
FY07	0
FY08	0
FY09	0
FY10	0

Project Manager	*Centers*	*Timeframe*	*Partners*
Bruce Davis	SSC	FY05 - FY09	DHS, FEMA, NOAA, NIBS, ARA. REASoN

Earth Science Products: WAVEWATCH III, ASTER, ALI, Landsat, Terra, Aqua, QuikSCAT

Other Apps.: Aviation, Public Health, Agriculture, Water Management

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report	complete	
Design and Implement	3/31/2005	
Verification and Validation Report	4/30/2006	
Benchmark Report	8/30/2006	
Project Plan	10/1/2005	

Notes: It is expected this project will request a no-cost extension.

Project: AWIPS — Directed Project

Purpose: To apply NASA's Science results to utilize remote sensing and model development for improvements and the development of the next generation of AWIPS. Goals: Validate improvements of NASA remote sensing technologies, such as LIS, Landsat ETM, SeaWinds, and MODIS to AWIPS.

Budget ($K)

Procurement

FY06	150
FY07	150
FY08	300
FY09	100
FY10	0

Project Manager	*Centers*	*Timeframe*	*Partners*
Bruce Davis	SSC (lead), GSFC, MSFC	FY05 - FY09	NOAA, FSL, UCAR, and other labs

Earth Science Products

Lambda Rail, HPCC, Web Map Services, Integration Systems, Satellite Data and models

Other Apps.

Aviation, Public Health, Agriculture, Water Management

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report	3/31/2007	6ASP06.A
Design & Implement	9/30/2007	
Verification and Validation Report	9/30/2009	6ASP06.A
Benchmark Report	3/31/2009	
Project Plan	10/1/2005	

Notes:

Project: WildFire (Remote Sensing Applications Center, NIFC, FIREWISE) — Directed Project

To evaluate NASA's science results in prediction to benefit RSAC Forest Service. Goals: Improve wildfire assessments at the RSAC that feed information to the NIFC decision support center using TRMM, QuikSCAT, and and other NASA assets.

Budget ($K)

Procurement

FY06	150
FY07	300
FY08	100
FY09	200
FY10	0

Project Manager	*Centers*	*Timeframe*	*Partners*
Rodney McKellip	SSC (lead), ARC	FY05 - FY09	DHS, FEMA, USGS, NOAA, USDA, FS,

Earth Science Products

MODIS Rapid Response, Fire Fuels Modeling, WRF forecast model, Vegetation Stress, Sensorweb.

Other Apps.

Aviation, Public Health, Agriculture, Water Management

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report	12/31/2006	
Design & Implement	6/20/2006	
Verification and Validation Report	12/31/2006	
Benchmark Report	6/30/2007	
Project Plan	12/31/2005	

Notes:

Project: AWIPS-Latest — Directed Project

To integrate NASA's research in lightning and severe storms into the NWS Advanced Weather Interactive Processing System operations, including the development of interoperable operations for AWIPS and geospatial access to AWIPS Satellite products.

Budget ($K)

Procurement

FY06	0
FY07	0
FY08	0
FY09	0
FY10	0

Project Manager	*Centers*	*Timeframe*	*Partners*
Steve Goodman	MSFC-SPoRT (lead), GSFC, SSC,	FY05 -	NOAA/NWS/NESDIS, FAA, DOD

Earth Science Products

LIS, Wind and Precipitation Products

Other Apps.

Air Quality, Aviation, Water Management

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report	9/30/2005	
Design & Implement	3/31/2006	
Verification and Validation Report	9/30/2006	
Benchmark Report	12/30/2006	
Project Plan	10/1/2005	

Notes:

Project: OSTP Subcommittee on Disaster Reduction				Project Management	
The SDR is an interagency group. The Subcommittee on Disaster Reduction (SDR) is an element of the President's National Science and Technology Council and facilitates national strategies for reducing disaster risks and losses that are based on effective use of science and technology. Mitigating natural and technological disasters requires a solid understanding of science and technology, rapid implementation of research information into disaster reduction programs and applications, and efficient access to diverse information available from both public and private entities. Chartered in 1988, the SDR provides a unique federal forum for information sharing; development of collaborative opportunities; formulation of science- and technology-based guidance for policy makers; and dialogue with the U.S. policy community to advance informed strategies for managing disaster risks.				*Budget ($K)* *Procurement*	
				FY06	30
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	30
Stephen Ambrose	GSFC, SSC, MSFC, Ames, JPL, LaRC	FY02 - Indef.	All Federal Agencies	FY08	45
				FY09	45
				FY10	50
Earth Science Products	Joint documents such as the Grand Challenges for Disaster Reduction.			*Other Apps.*	
Deliverables	*Description* / *End Date* / *IBPD Metric #* Evaluation Report Design & Implement Verification and Validation Report Benchmark Report				
Notes:					

Project: National Academies Disasters Roundtable				Project Management	
Disasters Roundtable - The Disasters Roundtable's mission is to facilitate and enhance communication and the exchange of ideas among scientists, practitioners, and policymakers in order to identify urgent and important issues related to the understanding and mitigation of natural, technological, and other disasters. Disasters Roundtable workshops are held three times a year in Washington, DC. Each workshop is focused on a specific topic or issue.				*Budget ($K)* *Procurement*	
				FY06	30
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	30
Stephen Ambrose	All NASA Centers	FY02 - Indefini	All Federal Agencies	FY08	30
				FY09	30
				FY10	30
Earth Science Products				*Other Apps.*	
Deliverables	*Description* / *End Date* / *IBPD Metric #* Evaluation Report Design & Implement Verification and Validation Report Benchmark Report			All Programs	
Notes:					

Project: Natural Hazards Research and Applications Information Center (NHRAIC)				Project Management	
The mission of the Natural Hazards Center at the University of Colorado at Boulder, funded by NSF and partner agencies, is to advance and communicate knowledge on hazards mitigation and disaster preparedness, response, and recovery. Using an all-hazards and interdisciplinary framework, the Center fosters information sharing and integration of activities among researchers, practitioners, and policy makers from around the world; supports and conducts research; and provides educational opportunities for the next generation of hazards scholars and professionals.				*Budget ($K)* *Procurement*	
				FY06	30
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	30
Stephen Ambrose	All NASA Centers	FY02 - Indefini	All Federal Agencies and Universities	FY08	30
				FY09	30
				FY10	30
Earth Science Products				*Other Apps.*	
Deliverables	*Description* / *End Date* / *IBPD Metric #* Evaluation Report Design & Implement Verification and Validation Report Benchmark Report				
Notes:					

Project: Disaster Management Working Group Meetings — Project Management

The Disaster Management Program has a working group of individuals from various organizations to help design the future of the disaster management program. Participants include: Disaster Management Working Group Members Include: Rob Sohlberg, University of Maryland Chris Justice, University of Maryland Paul Greenfield, Forest Service Sue Conard, Forest Service David Pieri, NASA JPL John LaBrecque, NASA Research Menas Kafatos, GMU Jay Pearlman, Boeing

Budget ($K)

Procurement

FY06	5
FY07	5
FY08	5
FY09	5
FY10	5

Project Manager	*Centers*	*Timeframe*	*Partners*
Stephen Ambrose	SSC, GSFC, JPL	FY06 - Indefini	USDA, Boeing, GMU, UMD

Earth Science Products

Other Apps.

Deliverables

Description	*End Date*	*IBPD Metric #*
Evaluation Report		
Design & Implement		
Verification and Validation Report		
Benchmark Report		
Working Group Meeting	3/6/2006	
Working Group Meeting	9/6/2006	
Annual Report	10/6/2006	

Notes:

Project: Development of Remote Sensing-assisted Natural and Technological Hazards Decision Support System				Solicitation	
Improve the utilization of NASA data sources, modeling, and systems engineering in disaster management and homeland security. Model human risk and vulnerability to hazards; develop system for rapid identification of remote sensing assets. Channels new NASA data sources into disaster management applications. Responds to the FEMA DSS - well connected with user organizations. Linked with the WSSD Module 3 project described in this plan. Project builds on existing capabilities by stakeholders. The total amount of REASoN funds for the five-year project is $2,054,323; FY04 is $616,696.				*Budget ($K)* *Procurement*	
				FY06	359
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	359
Bill Graham	SSC	FY04 - FY08	University of South Carolina	FY08	359
				FY09	
				FY10	
Earth Science Products				*Other Apps.*	

	Description	*End Date*	*IBPD Metric #*
Deliverables	Evaluation Report	4/1/2005	
	Design & Implement	4/1/2005	
	Verification and Validation Report	4/1/2005	
	Benchmark Report	4/1/2005	
	Project Plan	10/1/2005	

Notes:

Project: NASA Wildfire Response Research and Development, Applications and Technology Implementation				Solicitation	
Benchmarks the use of UAVs and improved telecommunications for disaster management with potential extension to Homeland Security; Combines existing technology with new platforms and instrumentation to address decision support requirements in tactical situations; Responds to high priority research and operational needs of the USFS partner; and, Collaborates closely with the Rochester Institute of Technology (RIT), which who received a Congressionally-directed project in FY2004 and FY2005. The total amount of REASoN funds for the five-year project is $2,643,082; FY04 is $600,000.				*Budget ($K)* *Procurement*	
				FY06	511
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	511
Steve Ambrose	SSC	FY04 - FY08	USGS, RIT	FY08	511
				FY09	0
				FY10	0
Earth Science Products				*Other Apps.*	
Deliverables	*Description*	*End Date*	*IBPD Metric #*	Homeland Security	
	Evaluation Report	N/A			
	Design & Implement	9/30/2005			
	Verification and Validation Report	4/30/2006			
	Benchmark Report	8/30/2006			
	Project Plan	10/1/2005			
Notes:					

Project: Center for Real-Time GPS Data and Products				Solicitation	
This project improves GPS technologies and in turn improves GPS earthquake monitoring stations. Funding: $100K from REASoN for 5 years, $100K from Applied Sciences, and $400K for 5 years from other sources. The Disaster Management Program does not manage this project but contributes to the goals of improved GPS systems. Funds for this project are expected to come from the Program Director's funds.				*Budget ($K)* *Procurement*	
				FY06	
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	
	SSC (lead) JPL	FY04 - FY08		FY08	
				FY09	
				FY10	
Earth Science Products				*Other Apps.*	
Deliverables	*Description*		*End Date*	*IBPD Metric #*	
	Evaluation Report				
	Design & Implement				
	Verification and Validation Report				
	Benchmark Report				
Notes:					

Project: Enhancements to the BlueSkyRAINS Emissions Assessment and Air Quality Prediction System				Solicitation	
Project goal is to evaluate, validate and benchmark role of NASA science products, observational spacecraft measurements, and assimilation products to support emissions inventories, factors, etc. that serve air quality planning, assessments, forecasting, etc. The project is a combo of activities: RPO WRAP to support regional haze, with BlueSkyRAINS, and on-going efforts to support emissions inventories. FY05: Project with RPO WRAP to examine Earth science products to support modeling for 2002 regional haze responsibilities. Eval/validate/benchmark role of Earth science products to capture fires and emissions - compare observed to reported fire databases. Prototype technique to extend to emission inventory. Activities to support the BlueSkyRAINS test in Summer 2005, incl. eval of Earth science products to support BlueSkyRAINS and development of integration plan. FY06-07: Develop prototype for on-going use of Earth science results for emissions inventories.				*Budget ($K)* *Procurement*	
				FY06	180
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	
Amber Soja	LaRC (lead), GSFC	FY04 - FY06	WRAP, EPA, USDA	FY08	
				FY09	
				FY10	
Earth Science Products	Terra-MODIS, MOPITT, Aqua-MODIS, CALIPSO			*Other Apps.*	
Deliverables	*Description* — *End Date* — *IBPD Metric #* Evaluation Report Design & Implement Verification and Validation Report Benchmark Report				
Notes:					

Project: Enhancing the Famine Early Warning System Network Decision Support System with NASA Earth System Science data and Modeling Results				Solicitation	
Enhancement to the FEWS Net decision support tool used by USAID to monitor famine conditions in 28 countries. The enhancements include: 1) MODIS/ANHRR NDVI, TRMM/GPCP/CMAP preceipitation and MODIS atmopsheric humidity to estimate critical parameters for water avialability four months in advance; 2) monitoring crop condition using MODIS 250 m and Landsat 30m reflectance data				*Budget ($K)* *Procurement*	
				FY06	397
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	407
Rodney McKellip	GSFC, SSC	10/1/20 - 9/30/20	NOAA, USAID, USGS, UCSB, SSAI	FY08	
				FY09	
				FY10	
Earth Science Products				*Other Apps.*	
Deliverables	*Description*	*End Date*	*IBPD Metric #*	Public Health, Agricultural Efficience	
	Evaluation Report	4/1/2006			
	Design & Implement				
	Verification and Validation Report	10/1/2007			
	Benchmark Report	9/30/2008			
	Begin V and V	10/1/2006			
Notes:					

Project: Enhancement of the US Drought Monitor by Integrating NASA Earth Science Data				Solicitation	
This project is a combined Decisions project with Son Nieghm of JPL and Bob Verdin of USGS as Co'I's. The project uses a variety of hydrological and land use cover projects to improve the Drought Monitor project. The proposed work will assimilate hydrologic and ecologic observations from NASA Earth satellite sensors, including the Advanced Microwave Scanning Radiometer (AMSR-E), the QuikSCAT/SeaWinds Scatterometer (QSCAT), and the Moderate Resolution Imaging Spectroradiometer (MODIS), into the U.S. Drought Monitor (USDM), hosted by the National Drought Mitigation Center at the Univ. of Nebraska. The investigators will apply a systematic approach using the systems engineering process of evaluation, verification/validation, and benchmarking to achieve major improvements in national drought monitoring and early warning capabilities. NASA satellite products to be evaluated and incorporated include soil moisture, precipitation water on land surface, and vegetation state.				*Budget ($K)* *Procurement*	
				FY06	466
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	466
Son Neighm	, JPL, (lead) SSC	1/1/200 - 1/1/200	USGS	FY08	466
				FY09	
				FY10	
Earth Science Products	1) Incorporates AMSR-E, QSCAT, & MODIS products 2) Uses MODIS NDVI data to create a Vegetation Drought Response Index (VegDRI), which is then integrated into USDM.			*Other Apps.*	
Deliverables	*Description* — *End Date* — *IBPD Metric #* Evaluation Report Design & Implement Verification and Validation Report Benchmark Report			Water Management	
Notes:					

Project: National Drought Monitoring System for Drought Early Warning Using Hydrologic and Ecologic Observations from NASA Satellite Data				Solicitation	
				Budget ($K) *Procurement*	
				FY06	
Project Manager	*Centers*	*Timeframe*	*Partners*	FY07	
Son Nghiem	JPL	-		FY08	
				FY09	
				FY10	
Earth Science Products				*Other Apps.*	
Deliverables	*Description* Evaluation Report Design & Implement Verification and Validation Report Benchmark Report	*End Date*	*IBPD Metric #*		
Notes:					

E. Additional Activities & Linkages

NASA and Science Mission Directorate Priorities

- Federal Enterprise Architecture (FEA) is a business and performance-based framework to support cross-agency collaboration, transformation, and government-wide improvement.
- The Global Information Grid (GIG) is the first stage of a U.S. military global, highbandwidth, Internet protocol-based communications network (a.k.a., ëthe Internet in space').
- The Joint Center for Satellite Data Assimilation (JCSDA) is a multi-agency collaboration to accelerate and improve the quantitative use of research and operational satellite data in weather and climate prediction models. NOAA (NESDIS, NWS, OAR), NASA, Navy, Air Force, and NSF (through UCAR) collaborate in JCSDA.
- Metis is a visual modeling software tool for planning, developing, and analyzing agencies' enterprise architectures. The Applied Sciences Program is using Metis to identify possible linkages between observations, models, and decision support tools to support the IWGEO and NASA/NOAA R2O activities.
- Observing System Simulation Experiments (OSSEs) use simulated observations to assess the impacts of future satellite instruments on weather and climate prediction and provide opportunities to test new designs and methodologies for data gathering and assimilation.
- Project Columbia is a NASA-wide project to develop a new, fast supercomputer (using an integrated cluster of interconnected processor systems) to support the Agency's mission and science goals, including enhanced predictions of weather, climate, and natural hazards.

Activity: New Investigator Program (NIP)
Purpose: The Education Program of the Science Mission Directorate supports a number of new investigators.
Goals: To ensure the results of this Science research are carried forward to the user community.

Activity: Space Weather Applications for Disaster Management
Purpose: In support of the sun/earth connection exploration vision, the Disaster Management program is evaluating the benefits of Space Weather research towards improvements to disaster management models and decision support systems.

Activity: Post-Doctorial Research Candidate in support of SENH
Purpose: Under an agreement with the Solid Earth and Natural Hazards Research Program, half of the cost of a post doctorial research candidate will be provided to assist in the analysis of data obtained from the SENH project

E. IBS Request

- A Rapid Prototyping Center is a proposed center at Stennis to support NASA and partners in testing and verification of Earth science results in decision support tools.
- Transition from Research to Operations Network (R2O) is a network that focuses on systematically transitioning the results of research to operational uses.

Program Response to IBS Request

To be supplied by program management.

E. Crosscutting Request

DEVELOP is a student-based program for rapidly prototyping solutions for state and local applications and helping students develop capabilities related to Earth science.

Earth-Sun System Gateway is a "portal of portals" providing an access point through an Internet interface to all web-enabled NASA research results.

Program Response to Crosscutting Request

To be supplied by program management.

VI. Budget: FY06-010

The following table lists the Disaster Management Program budget (procurement) for FY2006:

Project	FY06 Procurement Allocation ($K)
Hurricane, Flood, Landslide Continuum - Deformation, Landslides, Mudslides	$ 250
WSSD Sustainable Development for Africa -	$ 150
Wind, Surface Roughness, WaveWatch for HAZUS-MH	$ 0
AWIPS	$ 150
WildFire (Remote Sensing Applications Center, NIFC, FIREWISE)	$ 150
Development of Remote Sensing-assisted Natural and Technological Hazards Decision Support System	$ 359
NASA Wildfire Response Research and Development, Applications and Technology Implementation	$ 511
Center for Real-Time GPS Data and Products	$ -
AWIPS-Latest	$ 0
Enhancements to the BlueSkyRAINS Emissions Assessment and Air Quality Prediction System	$ 180
Enhancing the Famine Early Warning System Network Decision Support System with NASA Earth System Science data and Modeling Results	$ 397
Enhancement of the US Drought Monitor by Integrating NASA Earth Science Data	$ 466
National Drought Monitoring System for Drought Early Warning Using Hydrologic and Ecologic Observations from NASA Satellite Data	$ -
MRC-IDQ - Integrating Climatic and Fuels Information into National Fire Risk DST	$ -
OSTP Subcommittee on Disaster Reduction	$ 30
National Academies Disasters Roundtable	$ 30
Natural Hazards Research and Applications Information Center (NHRAIC)	$ 30
Disaster Management Working Group Meetings	$ 5
Solid Earth Natural Hazards Projects	$ 0
Total =	$ **2708**

Appendix C lists program-wide budget allocations for FY2006-10.

VII. Program Management and Performance Measures

The Disaster Management team uses performance measures to track progress, to identify issues, to evaluate projects, to make adjustments, and to establish results of the program element. These measures serve as condition indicators to help monitor progress within and across specific project activities to ensure that the Program meets its goals and objectives. The management team continually analyzes these measures, tracking conditions and identifying issues to keep the Program aligned with this Plan to meet its objectives.

The Program uses two performance measures: Program Management measures assess activities within the program, and Performance measures assess whether external program activities are serving their intended purpose. The Applied Sciences Program also uses this information in preparing IBPD directions and U.S. Office of Management and Budget (OMB) Program Assessment Rating Tool (PART) responses.

Performance Management Measures (Internal):

Inputs:
1) Potential issues and DST identified for Disaster Management – number, type, range
2) Eligible partners to collaborate with – number, type, range
3) Potential results/products identified to serve Disaster Management – number, type, range

The Disaster Management Program Element will implement steps to populate the Federal Enterprise Architecture Tool (Metis) with all relevant element information.

Outputs:
1) Assessments or evaluations of DST – number, range
2) Assessments of Earth-Sun System Science results/products to serve DST – number, range
3) Agreements with partners – presence
4) Reports (evaluation, validation, and benchmarks) – number, type

Quality and Efficiency:

1) Earth-Sun System Science results/products – number used per DST, ratio of utilized to potential
2) Agreements – ratio of agreements to committed partners
3) Reports – partner satisfaction, timeliness, time to develop
4) Reports – ratio of validations to potential products, ratio of benchmarks to validations

Performance Measures (External)

Outcomes:
1) Science products adopted in DSTs – number, type, range; use in DST over time
2) Science products in use – ratio of products used by partners to reports produced
3) Partner and DST performance – change in partner DST performance, number and type of public recognition of use and value of Science data in DST

Impacts:
1) Partner value – change in partner metrics (improvements in value of partner decisions)

In addition to the stated measures, the Disaster Management Program Manager periodically requests an assessment of its plans, goals, priorities, and activities through external review. The Disaster Management team uses these measures, along with comparisons to programmatic benchmarks, to support assessments of the Applied Sciences Program (e.g., internal NASA reviews and OMB PART). Specifically, the Disaster Management Program manager uses comparisons to similar activities in the following programs (i.e., program benchmarks) to evaluate its progress and achievements:

- Environmental and Societal Impacts Group at the National Center for Atmospheric Research (NCAR)
- Global Monitoring for Environment and Security (GMES)
- President's Subcommittee on Disaster Reduction (OSTP/CENR/SDR)

FY06 Performance Measures Satisfied by the Program – IBPD

This Program demonstrates that it plans to satisfy the following IBPD Performance Measures for FY2006:

Outcome Goal 1.2.1: Through 2012, benchmark the assimilation of observations (geophysical parameters, climate data records) provided from 20 of the 80 remote sensing systems deployed on 26 NASA Earth observation research satellites.

The Disaster Management Program will benchmark at least three (e.g., MODIS, SeaWinds, LIS) of the 20 remote sensing systems from at least three of the 26 Earth observation research satellites. This goal is accomplished through results of the SENH, REASoN, and other projects and moved into operational use through Science tools, models, products, and data.

Outcome

Goal 1.2.2: By 2012, benchmark the assimilation of five specific types of predictions resulting from Science Model Framework (ESMF) of 22 NASA Earth-Sun system science models.

Goal 5ESA6 – Crosscutting Solutions: Benchmark solutions associated with at least five decision support systems that assimilate predictions from Earth-Sun System science models developed and maintained by the Goddard Institute for Space Studies (GISS), the Geophysical Fluid Dynamics Laboratory (GFDL), NCEP, SPoRT, and the JPL Science laboratories. The Disaster Management Program currently has linkages with NASA DEVELOP, SYNERGY, and Cross cutting Solutions activities. NASA research laboratories, such as the SPoRT Center, are moving Science research results forward through direct connection with such operational entities as NOAA. The Disaster Management Program also works closely with the USGS in assimilating research results in the solid science areas for the benefit of the user agencies, such as DHS/FEMA.

By 2009, the Disaster Management Program will benchmark solutions to one of the five 5ESA6 decision support systems: HAZUS-MH. The HAZUS-MH decision support system has such flexibility and modularity that it covers at least three of the science research areas – flood, wind, and earthquake – and may cover wildfire in the future. These

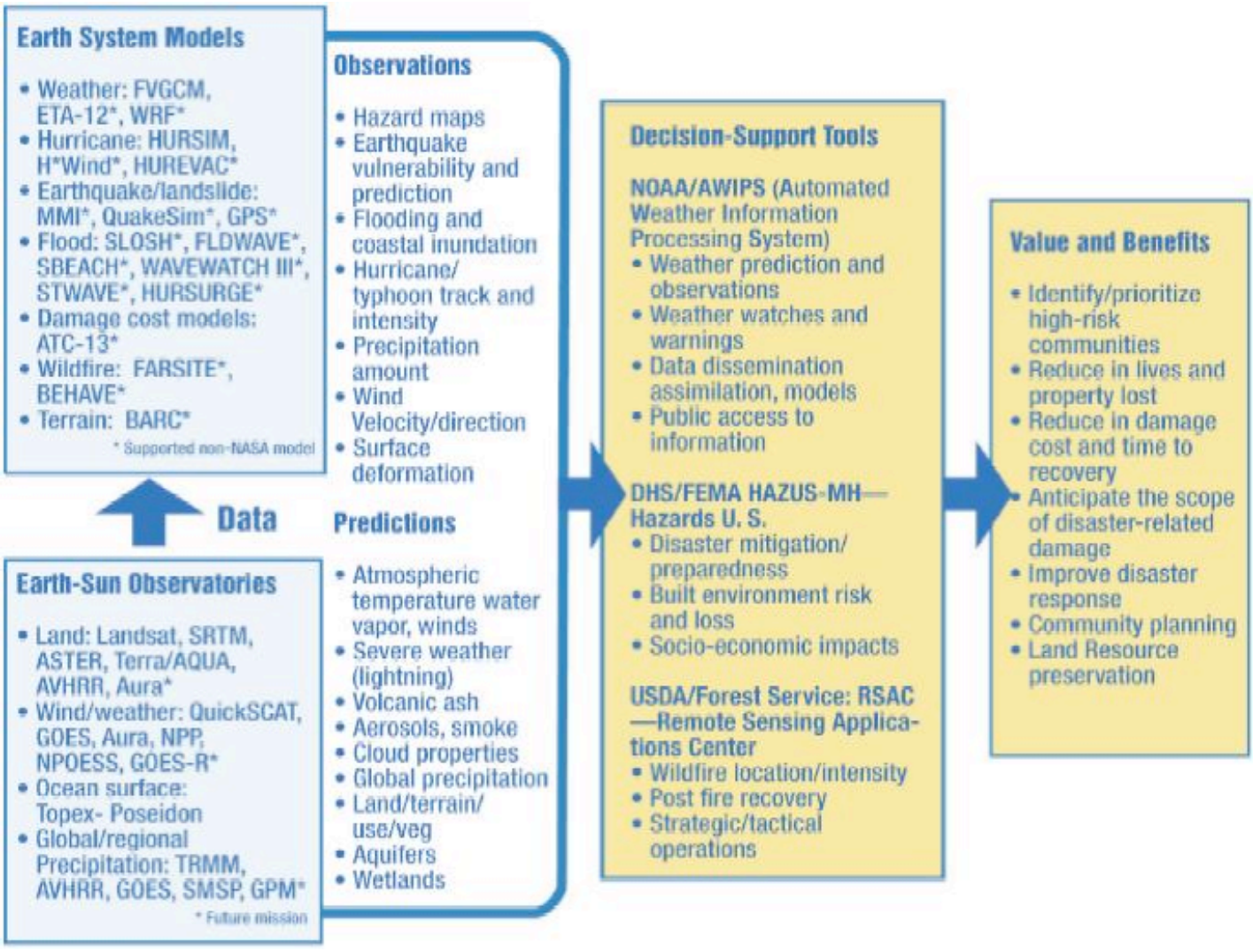
areas were identified by partners DHS, FEMA, USGS, and NOAA as important areas that can be addressed by Earth-Sun Systems science.

The value of applications in these areas have also been identified in the OSTP Subcommittee on Disaster Reduction policy documents as well as in the strategic plans of the partner agencies.

VIII. Appendicies

A. Integrated System Solutions Diagram

The figure below illustrates how Science measurements, model products, and data fusion techniques support the Disaster Management Program's partners and their decision support tools and shows the value and benefits of Science to society.



B. Roadmap

T he Disaster Management Roadmap shows the migration of NASA Science research results to improvements in risk assessments and loss estimation of the HAZUS Multi-Hazard DST. The Roadmap ties to the priorities and expected plans and results of the Office of Science Applied Sciences Program. State 1 is the ability to use HAZUS-MH for earthquake preparedness and mitigation. State 2 takes HAZUS-MH to the level of wind, flood, severe storms, and wildfire - areas where NASA's Science research results can be applied effectively. The modularity of HAZUS-MH makes the integration of satellite observations and models useful, but the challenge is the integration of global technologies to regional and local scales. Science research plays a valuable role in ensuring that NASA's Science results meet the needs of our partner agencies by integrating technology and science into the hazard response community in a cost-effective and useful manner.


Disaster Management
HAZUS-MH - Risk Assessment and Loss Estimation
Primary Partners:
USGS
Socioeconomic Impact
State 1- Earthquake Damage assessment
State 2- Improved
Hurricane prediction
Flood prediction
Severe Storm prediction
Wildfire prevention and prediction
Earthquake prediction
An operational decision support system for quantification and verification of solutions for natural hazard predictions.
Production of assimilated data sets, reanalysis of long period observations
Outcomes: Improvement in climate data and information for risk assessments
Impacts: Reduce losses related to flood and wind disasters. Better community planning
Understanding of Earths gravity field And terrestrial reference frame changes in geomagnetic field and understanding of sea level change and climate
Improved measurements of soil moisture, global precipitation, water vapor, and wind
Land use/Land cover, changes in earth's surface topography and Improved geodetic imaging, ocean measurements to track hurricanes
Transfer of advanced event-modeling capabilities using next-generation hardware, software, and communications
Outcomes: Improvement of the HAZUS-MH earthquake assessments And flood inundation for coastal areas
Impacts: Reduce losses related to hurricanes and earthquakes.
Outcomes: Improvement in wildfire prediction, HAZUS-MH High Winds Module Final Version
Impacts: Reduce losses related to hurricane, fire, and high wind disasters.
Outcomes: Improvement of FEMA planning, and response capabilities to weather and natural hazards
Impacts: Reduce losses across all weather-driven Disasters and earth movement
Outcomes: Improvement of FEMA capabilities across all hazards and phases
Impacts: Reduce losses across all disasters
QuikSCAT
Terra
Aqua
TRMM
SeaWinds
OcnTopo
Hydros *
OSWinds
Aquarius
NPOESS
* Pre-formulation
2004
2005
2006
2008
2010
2020

C. Applied Sciences Program Budgets FY2006-10

The following figures represent the FY06 budgets for the respective Program Elements; they do not represent the entire Applied Sciences Program budget. There is an additional $8.95million in Congressionally-directed activities and $5million for the Mississippi Research Consortium that these figures do not incorporate.

Program Element	FY06 Procurement Allocation
National Applications	
Agricultural Efficiency	$ 1,955,803
Air Quality	$ 3,116,464
Aviation	$ 3,048,878
Carbon Management	$ 1,544,831
Coastal Management	$ 1,416,233
Disaster Management	$ 2,743,760
Ecological Forecasting	$ 3,240,170
Energy Management	$ 1,875,253
Homeland Security	$ 1,987,054
Invasive Species	$ 2,241,940
Public Health	$ 3,356,124
Water Management	$ 1,714,341
Crosscutting Solutions	
DEVELOP	$ 1,498,000
Geospatial Interoperability	$ 2,400,000
Solutions Networks	$ 2,822,000
Integrated Benchmarking System	$ 4,500,000

The following figures show the five-year run-out for the entire Applied Sciences Program. The figures are based on the FY07 President's budget submitted to Congress. The lower line shows the target budget including agency corporate and institutional adjustments.

	2006	2007	2008	2009	2010
Present Budget Summited to Congress	53,254,855	51,049,000	50,287,000	48,588,000	48,662,000
Target After Adjustments	47,321,663	39,101,000	33,922,000	34,801,000	34,803,000

D. Related NASA and Partner Solicitations and Grants

Appendix D lists NASA Earth-Sun system science research projects, Earth science fellowships, GLOBE activities, and Earth science New Investigators related to Disaster Management activities.

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
ARC	Pieri	Use of airborne technology for volcano hazard characterization and monitoring (one-year project funded in FY03 only)	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
Dartmouth	Brackenridge	Flood application based on Science products with outstanding international partnership (WSSD related)	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
JPL	Fielding	Land subsidence SAR application pushing the data, technology, applied use to the limit. Utility for InSAR development.	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
USGS	Johnson	Pushes commercial LIDAR acquisition to limit of technology and industry capabilities.	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
University of Maryland	Arsenault	Innovative use of Land Data Assimilation Systems (LDAS) output for flood/drought decision support by reclamation	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
University of Maryland	Sohlberg	First sustained support for new product/service innovation in MODIS RR. Linked to Sensorweb technologies.	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
University of Maryland	Kasischke	Coastal change study to characterize regional/local sea level change. (Sea Level Change and InSAR related)	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
University of California	Kim	Advanced utilization of the SCIGN array for flood and wildfire prediction (GPS seismic network)	2003-2005

Other

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
University of San Diego	Bock	Unique real-time civilian infrastructure strain monitoring applications of SCIGN array (GPS seismic network)	2003-2005

Research Projects

SENH NRA

Institution	*PI*	*Title/Subject*	*Timeframe*
Veridian	Bourgeau	Application of SAR technology for wildfire risk analysis.	2003-2005

E. Acronyms and Websites

ACRONYMS:

AIRS	Atmospheric Infrared Sounder
AIWG	Applications Implementation Working Group
AMSR-E	Advanced Microwave Scanning Radiometer-EOS (Japanese)
ARA	Applied Research Associates
ARC	Ames Research Center
ARGIS	ESRI GIS Software]
ARCFOREST	ESRI Based Forest Decision Support System in Canda
AWIPS	Advanced Weather Interactive Processing System
CCSP	Climate Change Science Program
CCTP	Climate Change Technology Program
CEISC	Committee on Environmental Information Systems and Communications
CEISIN	Consortium for International Science Information Network
CENR	Committee on Environment and Natural Resources
CEOS	Committee on Earth Observation Satellites
COE	Corps of Engineers
CSTARS	Center for Southeastern Tropical Remote Sensing
DEVELOP	No longer an acronym
DHS	Department of Homeland Security
DSS	Decision Support Systems
EPA	US Environmental Protection Agency
ESA	Earth Science Applications
ESG	Earth-Sun Gateway
ETA	Event Tree Analysis
ETM	Enhanced Thematic Mapper
FAA	Federal Aviation Administration
FARSITE	Forest Service Fire Decision Support System
FEA	Federal Enterprise Architecture
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FIREWISE	Forest Service Fire Decision Support System
FS	Forest Service
FY	Fiscal Year
GCM	Global Climate Model
GCOS	Global Climate Observing System
GEO	ad hoc Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GDIN	Global Disaster Information Network
GFDL	Geophysics Fluid Dynamics Laboratory
GIG	Global Information Grid
GIO	Geospatial Interoperability Office
GIS	Geographic Information System

GISS	Goddard Institute for Space Studies
GLOBE	Global Learning and Observations to Benefit the Environment
GMES	Global Monitoring for Environment and Security
GOS	Geospatial One Stop
GPM	Global Precipitation Measurement
GPS	Global Positioning System
HAZUS	Hazard- United States
HAZUS-MH	Hazard- United States - Multi-Hazard
HIU	Humanitarian Information Unit
HPCC	High Performance Computing and Communications
IAGT	Institute for Applications of Geospatial Technologies
IBPD	Integrated Budget and Performance Document
IBS	Integrated Benchmarked Systems
ICMSSR	Interdepartmental Committee for Meteorological Services and Supporting Research
ICESat	Ice, Cloud, and Land Elevation Satellite
IGOS	Integrated Global Observations strategy
IMAAC	Interagency Modeling and Atmospheric Assessment Center
IMPLAN	Economic Input/Output model for fire cost assessment
INFORMS	Institute for Operations Research and the Management Sciences
INSAR	Interferometric Synthetic Aperture Radar
IOC	Intergovernmental Oceanographic Commission
IPO	Interagency Program Office (NPOESS)
ISRSE	International Symposium for Remote Sensing of the Environment
IWGEO	Interagency Working Group on Earth Observations
JCSDA	Joint Center for Satellite Data Assimilation
JPL	Jet Propulsion Laboratory
LANDFIRE	Land forest fire decision support system
LANDIS	Land fire probability model
LaRC	Langley Research Center
LDAS	Land Data Assimilation System
LIDAR	Light Detecting and Ranging
LIS	Lightning Imaging Sensor
MAGIS	Analytical Tool for Measuring fire extent (used with SIMPPLLE)
MIT	Massachusetts Institute of Technology
MLRRS	Modis Land Rapid Response System
MM5	Mesoscale Model
MODIS	Moderate Resolution Imaging Spectroradiometer
MOU	Memorandum of Understanding
MSFC	Marshall Space Flight Center
NASA HQ	NASA Headquarters
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NED	Northeast Decision Model
NEESPI	Northern Eurasia Earth Science Partnership Initiative
NESDIS	National Environmental Satellite Data Information Service

NIBS	National Institute for Building Sciences
NIERSC	Nansen International Environmental and Remote Sensing Center
NIFC	National Interagency Fire Center
NOAA	National Oceanic and Atmospheric Administration
NOAAPort	NOAA Data Portal for AWIPS
NPOESS	National Polar-Orbiting Operational Environmental Satellite System
NPP	NPOESS Preparatory Project/Net Primary Productivity
NRA	NASA Research Announcement
NRC	National Research Council
NSF	National Science Foundation
NWS	National Weather Service
OFCM	Office of the Federal Coordinator for Meteorology
OMB	Office of Management and Budget
OMI	Ozone Monitoring Instrument
ORA	Office of Research Applications
OSTP	Office of Science and Technology Policy
PART	Program Assessment Rating Tool
QuikSCAT	Quick Scatterometer
R&D	Research and Development
R2O	Research to Operations Network
RACNE	Regional Applications Center for the Northeast
RAINS	Rapid Assessment Information System (Forest Service)
REASoN	Research, Education, and Applications Solutions Network
RELMdss	Regional Ecosystems and Land Management (RELM). Decision Support
RFC	River Forecast Centers
RIT	Rochester Institute Technology
ROSES	Research Opportunities in Space and Earth Sciences
RSAC	Remote Sensing Applications Center
RSAWG	Remote Sensing and Applications Working Group
SAIC	Science Applications International Corporation
SAR	Synthetic Aperture Radar
SARA	Superfund Amendments Reauthorization Act
SCIGN	Southern California Integrated Global positioning system Network
SENH	Solid Earth Natural Hazards
SDR	Subcommittee on Disaster Reduction
SEA	State Enterprise Architecture
SEDAC	Socio Economic Data and Application Center
SERVIR	Regional Visualization and Monitoring System for the Mesoamerican Biological Corridor
SESWG	Solid Earth Science Working Group
SIMPPLLE	Simulating Patterns and Processes at Landscape Scales Acronym
SNAP	Special Needs Awareness Program
SPECTRUM	Analytical Tool to Support Ecosystem Management
SPoRT	Short-term Prediction Research and Transition Center
SPOT	French Satellite which Collects Information on Arousals and Ozone

SRTM	Shuttle Radar Topography Mission
SSC	Stennis Space Center
SSD	Satellite Services Division
SYNERGY	Congressionally Mandated Program
THORPEX	The Observing-System Research and Predictability Experiment
TerraVision	interactive terrain visualization system
TOPEX/POSEIDON	Satellite from JPL with Five Instruments
TRMM	Tropical Rainfall Measurement Mission
UCAR	University Corporation for Atmospheric Research
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDA	United States Department of Agriculture
USGS	United States Geological Survey
USWRP	United States Weather Research Program
UTOOLS	Microcomputer Software for Spatial Analysis and Landscape Visualization
V&V	Verification and Validation
VIIRS	Visible/Infrared Imager/Radiometer Suite
WASP	Wildfire Airborne Sensor Program
WAVEWATCH III	Ocean Wave Model
WCDR	World Conference on Disaster Reduction
WFO	Weather Forecast Office
WMO	World Meteorological Organization
WRAP	Wildfire Research and Applications Project
WRF	Weather Research and Forecast
WSSD	World Summit on Sustainable Development
WWRP	World Weather Research Program

WEBSITES:

AIWG: http://aiwg.gsfc.nasa.gov
Applied Sciences Program: http://science.hq.nasa.gov/earth-sun/applications
DEVELOP: http://develop.larc.nasa.gov
Earth-Sun System Gateway (ESG): http://esg.gsfc.nasa.gov/
Earth-Sun Science System Components: http://www.asd.ssc.nasa.gov/m2m
NASA FY2005 Budget: http://www.ifmp.nasa.gov/codeb/budget2005
Research and Analysis Program: http://science.hq.nasa.gov/earth-sun/science/
Science Mission Directorate: http://science.hq.nasa.gov
Science Strategies: http://science.hq/nasa.gov/strategy/